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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/831,931	05/15/2001	Soren Primdahl	11038/3	9855

7590 05/26/2004

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EXAMINER	
CREPEAU, JONATHAN	

ART UNIT	PAPER NUMBER
1746	

DATE MAILED: 05/26/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/831,931	PRIMDAHL ET AL.	
	Examiner	Art Unit	
	Jonathan S. Crepeau	1746	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 March 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,4,5 and 7-15* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,4,5 and 7-15* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. This Office action addresses claims 1, 4, 5, 7, and newly added claims 8-15. All the claims are newly rejected under 35 USC §112, first paragraph, and 35 USC §103 herein, as necessitated by amendment. Accordingly, this action is made final.

Claim Suggestions

2. In claim 7, it is suggested that "the portion of the electrode comprises 4-5% Mn" be changed to "the remaining portions of the electrode comprise 4-5% Mn" because in the terminology of claim 1, it is the latter limitation that is properly supported by the originally filed application. Appropriate correction is suggested.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 1, 4, 5 and 7-15 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the

relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Independent claims 1, 8, and 11 each recite that the portion of the electrode closest to the electrode (i.e, the portion within 20 microns) comprises 0.5 to 6 metal atom % Mn. There is not believed to be sufficient support for the upper endpoint, 6%, in the application as originally filed. The closest support is in original claim 2, which recites that the portion of the electrode spaced *more than* 20 microns comprises 1 to 6 metal atom % Mn. However, this does not support the recitation that the portion spaced *less than* 20 microns from the electrolyte has an upper endpoint of 6% Mn.

Additionally, independent claims 1 and 8 and dependent claim 15 each recite that the that the portion of the electrode spaced more than 20 microns comprises "substantially less than 6 metal atom % Mn." There is also not believed to be sufficient support for this recitation in the originally-filed application. Original claim 2 recites ranges of 0.5 to 10, preferably 1 to 6, % Mn. However, the new language is not supported by this disclosure because it sets an entirely new upper endpoint ("substantially less than 6" is different than "6"). Additionally, the new language encompasses values not originally disclosed, such as less than 0.5 %. As such, this language is also considered to introduce new matter into the application.

Claim Rejections - 35 USC § 103

5. Claims 1, 4, 5, and 7-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ruka et al (U.S. Patent 5,908,713) in view of JP 5-190183.

Regarding claims 1 and 8, Ruka et al. is directed to a solid oxide fuel cell ("SOFC") comprising an Ni/YSZ fuel electrode (see abstract). The electrode preferably has a thickness of 100-150 microns (see col. 7, line 11). Regarding claim 8, the electrode has a first layer (6) closest to the electrolyte (4) and a second layer (8) on top of the first layer (see Fig. 2).

Ruka et al. do not expressly teach that manganese is present in the fuel electrode, as recited in claims 1 and 8.

JP 5-190183 teaches an SOFC in the abstract. In paragraph 9 of the machine translation, the reference discloses an Ni/YSZ electrode comprising Mn in a molar ratio of 5-50 mol% with respect to all the metallic elements in the electrode. The disclosure of 5-50 mol% Mn corresponds to 5-50 metal atom% Mn since the reference identifies the mole percent as being with respect to "metallic elements."

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated by the disclosure of JP '183 to add 5-50 metal atom % Mn to the fuel electrode of Ruka et al. In paragraph 10 of the machine translation, JP '183 teaches that "[a]s for this inventor, when manganese it exists in portion of three-phase interface which consists of fuel electrode and solid electrolyte and gas phase, activated polarization of fuel electrode small becomes considerable, output of SOFC unit battery improves to discover, this invention was completed. Furthermore, according to this invention, because high melting point metal like ruthenium is not used, it is not necessary to use trace metal of high cost which can produce fuel electrode with conventional method and, such as ruthenium, praseodymium." Accordingly, the artisan would be motivated to use 5-50 metal atom % Mn in the fuel electrode of Ruka et al. Thus, the ranges recited in the

instant claims would be rendered obvious since the Mn would be present in an amount of 5 metal atom% in the whole electrode of Ruka et al., i.e., in a position closer than 20 microns from the electrode/electrolyte surface and in a position further than 20 microns therefrom.

While the JP '183 teaches that the Mn content may be 5 metal atom %, the reference does not expressly teach that the Mn content is between 1-4 metal atom % (claims 4 and 9), or between 2-3 metal atom % (claims 5 and 10).

However, the artisan would further be motivated by the disclosure of JP '183 to use a metal atom % of Mn within the ranges recited in instant claims 4, 5, 9, and 10 in the electrode Ruka. In Figure 4, JP '183 shows a graph of polarization resistance as a function of Mn content. Selected values from 0 mol% to 60 mol% Mn are plotted. In paragraph 25, the reference states that electric charge resistance "especially" goes down when the Mn content is between 5-50%, and that 10-30% is "more desirable." However, while there are no values between 0% and 5% expressly plotted in Figure 4, the artisan would clearly see than an improvement in polarization resistance is attained within this range of Mn content. Using the 0% point as a baseline, an Mn content of 4% would cut the polarization resistance roughly in half (see line "A" in Fig. 4). Thus, while the range of 1%-4% does not appear to be a preferred embodiment of the JP '183 reference, an artisan would nevertheless be motivated to use an Mn content within this range since it results in a significant improvement in polarization resistance. It has been held that the discovery of an optimum value of a result effective variable in a known process is ordinarily within the skill of the art. *In re Boesch*, 205 USPQ 215 (CCPA 1980).

6. Claims 11-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 5-190183 in view of Carolan et al (U.S. Patent 5,750,279)

JP 5-190183 teaches an SOFC in the abstract. In paragraph 9 of the machine translation, the reference discloses an Ni/YSZ electrode comprising Mn in a molar ratio of 5-50 mol% (i.e., 5-50 metal atom %).

JP '183 does not expressly teach that the "active layer" of the electrode has a thickness of no more than 20 microns, as recited in claim 11, or that the electrode comprises additional layers overlying the active layer, as recited in claims 14 and 15. Further, while the reference teaches that the Mn content may be 5 metal atom %, the reference does not expressly teach that the Mn content is between 1-4 metal atom % (claim 12) or between 2-3 metal atom % (claim 13).

However, the artisan would be motivated by the disclosure of JP '183 to use a metal atom % of Mn within the ranges recited in instant claims 12 and 13. As set forth above, in Figure 4, JP '183 shows a graph of polarization resistance as a function of Mn content. Selected values from 0 mol% to 60 mol% Mn are plotted. In paragraph 25, the reference states that electric charge resistance "especially" goes down when the Mn content is between 5-50%, and that 10-30% is "more desirable." However, while there are no values between 0% and 5% expressly plotted in Figure 4, the artisan would clearly see than an improvement in polarization resistance is attained within this range of Mn content. Using the 0% point as a baseline, an Mn content of 4% would cut the polarization resistance roughly in half (see line "A" in Fig. 4). Thus, while the range of 1%-4% does not appear to be a preferred embodiment of the JP '183 reference, an artisan would nevertheless be motivated to use an Mn content within this range since it results in a significant improvement in polarization resistance. It has been held that the discovery of an

optimum value of a result effective variable in a known process is ordinarily within the skill of the art. *In re Boesch*, 205 USPQ 215 (CCPA 1980).

Additionally, Carolan et al. is directed to an SOFC comprising an anode (326) (see Fig. 1). The anode preferably has a thickness of 1-20 microns (see col. 4, line 17). Carolan further teaches that conductive support structures such as a silver coating can be used in the electrode (col. 4, line 19).

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated by the disclosure of Carolan to modify the electrode of JP '183 so that it has a thickness of less than 20 microns. In column 4, line 14, Carolan teaches the following:

> the cathode on the opposing surface. The thickness of the anode or cathode on the ceramic electrolyte is generally between about 0.1 microns and about 100 microns, and preferably between about 1 to about 20 microns. The electrode layers are preferably thin in order to allow movement of gases freely therethrough. When very thin electrodes are used it may be desirable to use a current conductor, such as a metallic grid or a composite of the electrode with a silver coating applied over the electrode to minimize sheet resistance. From an ion transport standpoint, very thin electro-

This passage provides sufficient motivation for a person skilled in the art to use an electrode having a thickness of less than 20 microns as the electrode of JP '183, and further, to use a conductive structure overlying the electrode. In the terminology of the instant claims, the electrode material layer of Carolan is the "active layer" and the conductive support layers are the "additionally layers." Additionally, depending on the structure of the conductive layer, it would not contain manganese (as provided for in instant claim 15). As such, the subject matter of instant claims 11-15 would be rendered obvious to the skilled artisan.

Response to Arguments/Declaration

7. Applicant's arguments and declaration under 37 CFR §1.132 filed on March 22, 2004 have been fully considered but they are not persuasive. In section 6 of the declaration, Dr. Mogensen states that "[t]he beneficial effects of my invention are realized if MnO_x is only added to the anode in a defined region within about 20 microns of the electrolyte." However, this statement is not commensurate in scope with the claimed invention. Each of the independent claims, and dependent claim 15, allow for the presence of Mn throughout the entire electrode structure. There is no recitation that Mn is excluded from the furthest portion of the electrode, which feature is relied upon by Dr. Mogensen in asserting the benefits of the invention.

In addition, there is no comparison of the claimed invention with the closest prior art, which is believed to be JP 5-190183. JP '183 teaches an Mn content of between 5-50 metal atom%, which overlaps with the claimed ranges. In addition, Figure 4 of the reference fairly suggests Mn contents of less than 5%, as set forth above. It is further noted that Dr. Mogensen relies on the article entitled "Development of Thin-Electrolyte Solid Oxide Fuel Cells." The teaching regarding the undesirability of the entire anode structure containing manganese dioxide is noted (page 879, first paragraph). However, this teaching is not commensurate with the claimed invention, and further, the article does not appear to disclose the percentage of Mn in the anode closest to the electrolyte. As such, the article is also not persuasive in distinguishing the claimed invention over the prior art.

Conclusion

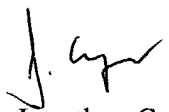
8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, THIS ACTION IS MADE FINAL. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jonathan Crepeau whose telephone number is (571) 272-1299. The examiner can normally be reached Monday-Friday from 9:30 AM - 6:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Randy Gulakowski, can be reached at (571) 272-1302. The phone number for the organization where this application or proceeding is assigned is (571) 272-1700. Documents may be faxed to the central fax server at (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Jonathan Crepeau
Patent Examiner
Art Unit 1746
May 23, 2004